Forest Resources Commission

Background Paper

The Economic Impacts of Selected Timber Harvest Scenarios in British Columbia

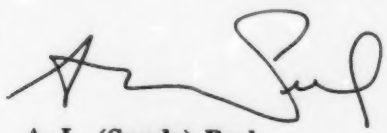
- Planning & Statistics Division
Ministry of Finance & Corporate Relations

Foreword

One of the responsibilities of the Forest Resources Commission is to examine the consequences of various policy options relating to our forests. Earlier this year we released a report entitled, *British Columbia Community Employment Dependencies*, that identified the extent to which communities in British Columbia are dependent on the forest industry for basic employment. This report, entitled *The Economic Impacts of Selected Timber Harvest Scenarios in British Columbia*, is designed to show the impact on employment and on the provincial treasury of reductions or increases in the amount of timber harvested annually in the Province.

A word of caution is needed when examining various harvest level scenarios. None is designed to be reflective of current circumstances; rather they reflect a range of harvest level reductions and increases that are possible depending on future government policy and actions. What is important is the magnitude of impact on employment and government revenue in British Columbia depending on the course chosen.

The Forest Resources Commission believes that by clearly setting out both the social and economic implications associated with possible courses of action this should assist government in its determination of policy.



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The Economic Impacts of Selected Timber Harvest Scenarios in British Columbia

Prepared for the
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1. INTRODUCTION

1.1 Model Structure

The Planning and Statistics Division (PSD) of the Ministry of Finance and Corporate Relations operates and maintains the British Columbia Econometric Policy Simulation Model (BC Model). The BC Model is a large and sophisticated econometric model of the British Columbia economy and is able to provide detailed estimates of the economic impacts of various policy alternatives or hypothetical scenarios. The advantages of using an econometric model for simulation of economic conditions are numerous. The BC Model:

- provides estimates of the timing of impacts;
- accommodates changing investment patterns;
- accommodates flexible wage rates;
- allows for substitution between labour and capital;
- provides a consistent accounting framework for economic analysis;
- allows inter-provincial as well as inter-industry labour mobility;
- ensures full feed through of indirect and induced effects; and
- provides estimates of the government revenue and expenditure position and fiscal balance.

The BC Model describes a small open economy that produces a number of goods and services, and consumes these goods and services and a number of foreign goods and services. In addition, some domestically produced goods and services are exported. The economy is organized into four broad sectors: firms, households, government and the external sector. Firms employ capital and labour to produce either cost-minimizing or profit-maximizing levels of output, and supply financial instruments. Households consume domestic and foreign products, supply labour and demand financial assets under the assumption of utility maximization. Governments collect taxes, purchase the domestic and foreign products, produce output and supply financial instruments. The external sector purchases domestic products, supplies foreign products, and demands and supplies financial instruments.

1.2 Simulations

In February 1992, the PSD was commissioned by the British Columbia Forest Resources Commission (FRC) to simulate the impacts of changes in the provincial timber harvest, using the BC Model. The FRC provided the hypothetical scenarios to be analyzed. These scenarios do not necessarily reflect current or proposed government policy. In addition, the scenarios do not reflect the regional implications of changes in the timber harvest with respect to harvest, employment or any other economic indicators.

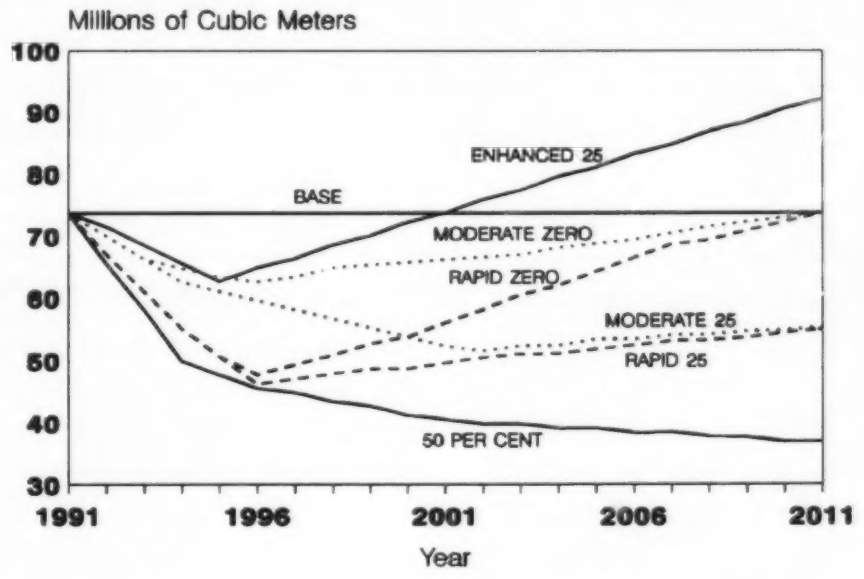
Six scenarios requested by the FRC and presented in this paper are:

- a moderate reduction to a harvest that is 25 per cent below current (1991) levels by the year 2011 (MODERATE 25);
- a rapid reduction to a harvest that is 25 per cent below current (1991) levels by the year 2011 (RAPID 25);
- a moderate reduction to a harvest that reflects current (1991) levels by the year 2011 (MODERATE ZERO);
- a rapid reduction to a harvest that reflects current (1991) levels by the year 2011 (RAPID ZERO);
- a reduction in timber harvest to reach 50 per cent of current (1991) levels by the year 2011 (FIFTY PER CENT); and
- a timber harvest scenario that, by 2011, reaches levels that are 25 per cent above current (1991) levels (ENHANCED 25).

As requested by the FRC, all simulations were performed maintaining the assumption that British Columbia forestry related producers are price takers in their export markets. Therefore, there are no changes in B.C. export prices in any of the scenarios examined. The economic variables examined include provincial Gross Domestic Product (GDP), investment, employment, the unemployment rate, and the government fiscal position. The results are presented as the change (percentage or level), resulting from the implementation of the particular shock, relative to a base case forecast that assumes constant harvest levels. Following FRC direction, the constant harvest simulation assumes a level of timber harvest equal to the 1991 timber harvest on regulated and unregulated lands (74 million cubic metres) along with some growth in all other sectors of the economy in the forecast period. The constant timber harvest throughout the forecast period results in declining shares of GDP for the forestry related industries. In the discussion that follows, the constant harvest simulation will be referred to as the "base".

The timing and magnitude of the scenarios were provided by the FRC[1]. Changes in harvest level are introduced in 1992 and continue through to the year 2011, the end of the forecast period. Figure 1 shows the harvest patterns which were simulated in the different harvest scenarios. These scenarios represent the views of the FRC and do not necessarily reflect government direction or policy.

FIGURE 1
SIMULATED TIMBER HARVEST LEVELS



The paper is presented as follows: Section 2 provides an overview of the model linkages as well as the methodology used to simulate the supply changes. The impacts on GDP and employment are presented in Section 3 followed by a more detailed examination of the results for each of the harvest scenarios. A summary is presented in Section 4, and Section 5 contains some concluding remarks.

The authors wish to gratefully acknowledge the assistance and valuable insight of Dr. Ernie Stokes of the WEFA Group (Canada) and our colleagues; Llew Hamdi, Dave Barnett, Fran Rothman and Kelly Chaplin, none of whom are responsible for any remaining errors or omissions.

1 See Appendix 2. The FRC further assumes that changes in the Annual Allowable Cut (AAC) are fully mirrored in the timber harvest. An additional scenario, ENHANCED 25, was added later.

2. METHODOLOGY

2.1 Overview

The BC Model contains three forestry related sectors. There is the primary forestry sector, or logging sector, which produces raw logs, and there are the two forestry related manufacturing sectors: wood, and paper and allied.

The primary forestry sector produces timber for further processing domestically in the other two forestry sectors, the wood products and paper and allied products industries. Due to current government regulations which restrict the export of unprocessed timber, all but approximately 1 per cent of the annual timber harvest is consumed domestically by the manufacturing industries[2].

FIGURE 2

ANNUAL TIMBER HARVEST VS MODEL FORESTRY OUTPUT

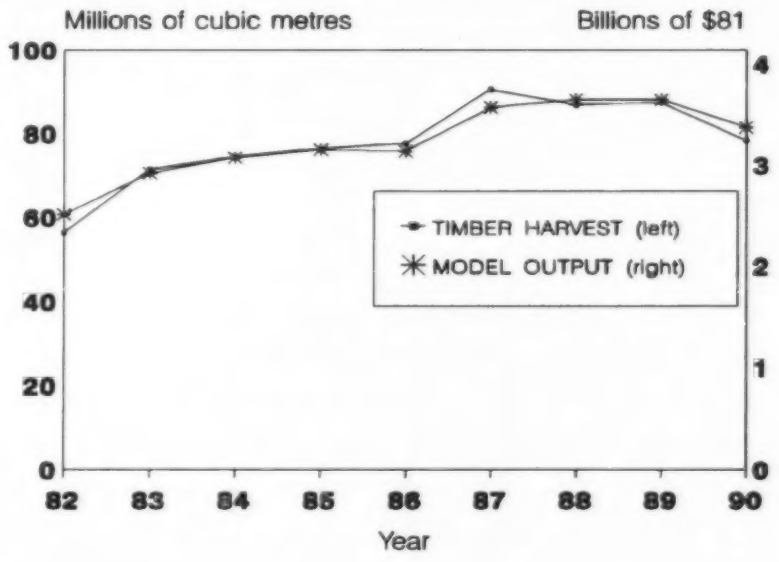


Figure 2 displays the historical relationship between timber harvest and the BC Model's forestry output variable. For each industry, the BC Model contains a variable which

2 British Columbia Forest Industry Statistical Tables, (COFI) April 1991.

proxies the constant (1981) dollar value of output. This type of variable is commonly used to proxy physical output.

As one would expect, there is a strong correlation between the value of forestry output measured in constant 1981 dollars, and the volume of output measured in cubic meters. The linear relationship implies that a percentage change in the model output variable will imitate the same percentage change in timber harvest. Thus, the target of the simulated supply reductions discussed below will be a reduction in the BC Model forestry output variable.

For simplicity, the following discussion will deal only with the implementation of the MODERATE 25 shock. The same principles apply to the other simulations as well.

It seems reasonable to expect that given a reduction of 25 per cent in the primary material input into the manufacturing process, that forestry related manufacturing firms would be forced to reduce production by 25 per cent. This will be true as long as firms do not become more efficient in their use of raw inputs, that is, there is a direct and constant ratio of production to timber supply. It is also assumed that firms do not import raw logs from elsewhere or use other sources of wood fibre such as deciduous trees and recycled paper. These are, in fact, the principal simplifying assumptions which are made in this paper. That is, we assume that a 25 per cent reduction in the timber harvest will result in a 25 per cent reduction in the output of the wood and paper and allied manufacturing industries. Therefore this study can be seen as an examination of the economic impacts of changes in timber harvest given the current state of technology, with no additional timber imports. The issues of changes in technology or the creation of additional value added activities, which may or may not result from a reduction in harvest, are not dealt with in this paper.

For the purposes of this shock, forestry related firms are modelled as cost minimizers with Cobb-Douglas constant returns to scale production functions[3]. That is, it is assumed that forestry related firms have constant returns to scale and act to minimize costs for a given level of output. For example, firms facing a 50 per cent reduction in

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3 The Cobb-Douglas production function is a specific form of production function. We assume that the function exhibits constant returns to scale. That is, production will change by same percentage by which inputs are changed. For example, if all inputs are increased by 30 per cent, then production increases by 30 per cent.

output will then purchase capital and labour so as to minimize their costs of production given the post-shock output level and relative factor prices.

We assume that all variables which are determined outside of the BC Model do not change. For example, the Canada/U.S. exchange rate and the national unemployment rate are kept at base levels. As well, we assume the *status quo* will continue with respect to provincial government fiscal policy. That is, we have not modelled any changes in tax rates or expenditures on goods and services in any of the simulations.

The methodological issue with the implementation of this shock is that, in the econometric model, output is demand driven[4]. Final demand[5] feeds through an input-output block to determine output by industry. This is accomplished by multiplying the vector of final demands by the impact matrix.

To effectively model a 25 per cent reduction in timber harvest, we must work backward by reducing final demand for the products of the industries which demand forestry output. As discussed above, a 25 per cent reduction in timber harvest will reduce output in the wood and paper and allied industries by approximately 25 per cent. Further, the output of the primary forestry industry is largely consumed by either the wood, or paper and allied industries. Thus, demand for wood and paper and allied products must be reduced by 25 per cent.

2.2 Reducing demand for forestry output

In essence, the reduction in demand is implemented as follows. The output of the primary forestry sector in B.C. is almost entirely consumed by the two forestry related manufacturing industries, wood and paper and allied. It follows that a 25 per cent reduction in final demand for wood and paper and allied combined with a 25 per cent reduction in timber exports, will feed through the impact table to result in a reduction in output of 25 per cent in the primary forestry sector as well as in the wood and paper and allied manufacturing sectors.

The reduction in final demand will also capture the indirect effects on industries which benefit indirectly from production by the forestry related industries. For example there

4 In the longer term, capacity and factor demand do influence supply.

5 Consumer Expenditures + Investment + Government Expenditures + (Exports - Imports)

will be a large impact on the service sector as a result of the reduction in forest related activities.

Induced effects will also be captured by this methodology. The BC Model contains 15 categories of consumer expenditures. The decreases in wage incomes and employment will act to reduce consumption. Since consumption is a component of final demand any reduction in consumption simultaneously feeds through the input-output block to impact production by industry.

The impact of changed economic conditions on the government sector will also be captured. Stabilization payments, such as federal unemployment insurance and provincial income assistance, will reflect the changing levels of population and unemployment. However, no attempt has been made to accommodate additional fiscal imbalances; we have not modelled any additional revenue or expenditure policy measures.

3. RESULTS

3.1 Overview

The following section is an overview of the employment and GDP impacts which result from the different harvest scenarios. Table 1 provides a summary of the impacts relative to the base 10 and 20 years into the simulation. A more in depth examination of the results for each scenario is presented in Sections 3.2 to 3.6.

TABLE 1
SUMMARY TABLE FOR GENERAL INDICATORS
(Per Cent Impact on Base)

	MODERATE ZERO	RAPID ZERO	MODERATE 25	RAPID 25	FIFTY PER CENT	ENHANCED 25
Year 2001						
GDP at Market Prices[6]	-2.7	-6.4	-7.1	-8.4	-11.3	-0.6
Consumer Expenditures[7]	-2.1	-4.9	-4.5	-5.9	-7.5	-0.1
Investment[8]	-1.9	-4.6	-4.8	-5.8	-7.8	-0.2
Exports[9]	-5.2	-12.3	-13.9	-16.4	-22.1	-1.5
Imports[9]	-2.2	-5.1	-4.6	-6.1	-7.7	-0.1
Wages and Salaries[10]	-2.5	-6.1	-6.4	-7.8	-10.2	-0.3
Employment	-1.6	-3.8	-3.9	-4.8	-6.3	-0.2
Unemployment Rate[11]	-0.0	-0.0	0.6	0.3	0.7	0.1
Year 2011						
GDP at Market Prices	-0.3	-0.6	-5.5	-5.7	-10.8	4.8
Consumer Expenditures	-0.6	-1.3	-4.3	-4.6	-8.0	2.7
Investment	-0.3	-0.6	-4.0	-4.1	-7.5	3.2
Exports	-0.5	-1.0	-10.0	-10.3	-19.6	8.8
Imports	-0.7	-1.5	-4.5	-4.9	-8.3	2.7
Wages and Salaries	-0.3	-0.6	-5.0	-5.2	-9.7	4.4
Employment	-0.3	-0.6	-3.4	-3.6	-6.5	2.6
Unemployment Rate	-0.2	-0.4	-0.0	-0.2	0.1	-0.5

When examining the results which follow, one should bear in mind that the BC Model is based on historical relationships. That is, the model is based on recent history[12] with existing technologies. Shocks to the model will be most reliable if they fall within the

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6 GDP at Market Prices is presented in constant (1981) dollars.

7 Consumer Expenditures are presented in constant (1981) dollars.

8 Investment is presented in constant (1981) dollars.

9 Imports and exports include trade with the rest of Canada as well as the rest of the world in goods only and are presented in constant (1981) dollars.

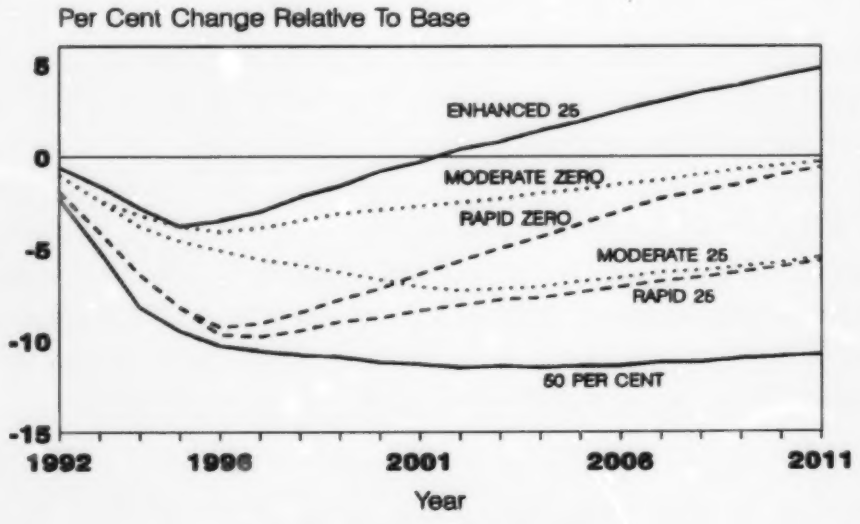
10 Wages and salaries are presented in current dollars.

11 Unemployment rate impacts are presented as level changes.

12 Equations are usually estimated with anywhere between 10 and 15 years of data, depending on data reliability and consistency.

boundaries of previous changes in the economy. If, for example, past output in a particular industry had grown by 30 per cent, then model results for a 30 per cent increase in that industry would likely represent a reasonable estimate of reality.

FIGURE 3
GDP IMPACT
OF CHANGES IN TIMBER HARVEST



As shown in Figure 3 (above), the BC Model predicts significant differences in GDP resulting from the various harvest level scenarios. The first scenario, MODERATE 25, shows real GDP 1 per cent lower than base levels in 1992. The impact grows steadily to peak at just over 7 per cent in 2002. From 2003 the impact steadily falls to just over 5 per cent by 2011. The RAPID 25 scenario results in real GDP levels that are almost 2 per cent lower than the base simulation in 1992, peaking at almost 10 per cent lower in 1997 and recovering steadily to approximately 6 per cent less than base levels by 2011. As can be seen from the comparison of the two 25 per cent reduction scenarios, the timing and severity of the timber harvest reduction provides significantly different impacts in the medium term and a converging of impacts in the long-term.

The impact of the MODERATE ZERO simulation grows from -1 per cent in 1992, peaking at -4 per cent in 1996 and moderating to less than one per cent by 2011. The RAPID ZERO scenario starts off at almost 2 per cent lower than the base case in 1992.

The impact grows to -9 per cent in 1996, falling thereafter to less than one per cent lower than base levels in 2011.

The results of the FIFTY PER CENT simulation show real GDP more than 2 per cent lower than base levels in 1992. This impact grows to a peak (almost 12 per cent) in 2002, and gradually declining thereafter. By 2011 GDP is just short of 11 per cent lower than base levels.

After initially falling relative to the base, real GDP in the ENHANCED 25 scenario grows faster than in the base as timber harvest levels begin to increase. By 2011, GDP is almost 5 per cent higher than base levels.

The industry share of GDP will change in the long-run as a result of the various harvest scenarios, including the base. Figure 4 displays the relative share of GDP of each industry for the forecast period. It should be noted that industry GDP is presented at "Factor Cost". This measure excludes indirect taxes and subsidies which are included in the "Market Price" measure used for total GDP.

FIGURE 4

SHARE OF TOTAL GDP
CONSTANT HARVEST (BASE) SCENARIO

It is clear that, in the base, the GDP shares of the forest related industries is declining relative to other sectors falling from 9 per cent in 1992 to 6 per cent in 2011. This occurs primarily because the forestry industry is held at constant levels while other sectors are growing. Since forestry becomes a smaller share of GDP over the forecast, the provincial impact of a reduction in forest related activity is lessened. This pattern becomes more pronounced for reductions in timber harvest. Although the forestry sector share of GDP is seen to fall by "only" 3 percentage points, this represents a decline of over 30 per cent in the share itself.

FIGURE 5

EMPLOYMENT IMPACT
OF CHANGES IN TIMBER HARVEST

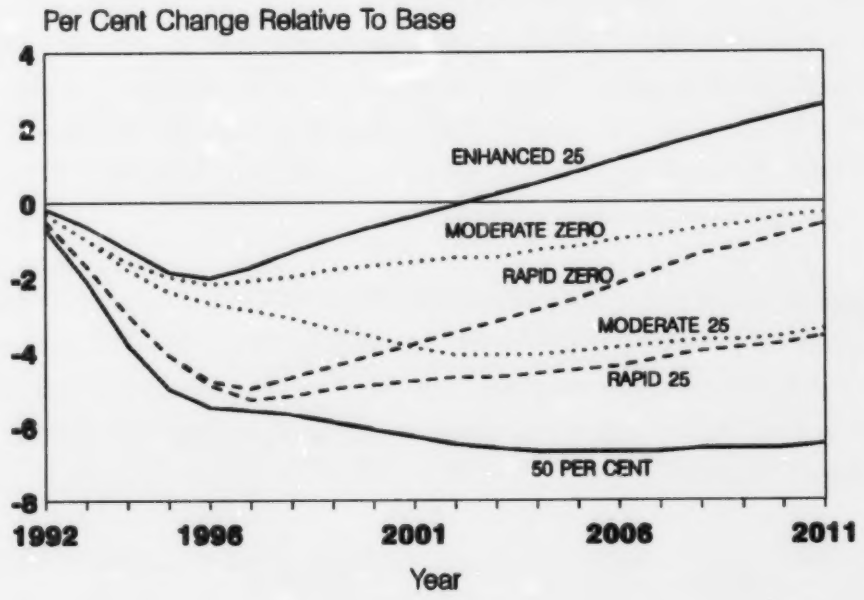


Figure 5 shows the employment impacts which result from the various timber harvest scenarios. As with GDP, the timing and severity of the impacts has a marked effect in the short term, converging by the end of the simulation. The MODERATE 25 simulation shows employment less than one half of one per cent lower than base levels in 1992. The negative employment impact grows to approximately 4 per cent by 2003, after which the impact is reduced to approximately 3 per cent (almost 75,000 jobs) lower than base levels by 2011. The employment impacts from the RAPID 25

simulation are somewhat stronger than those for the gradual path. Starting at less than one per cent in 1992, the impact grows until employment levels are more than 5 per cent less than base levels in 1997. Thereafter the impact is steadily reduced until the end of the simulation, when employment is not quite 4 per cent lower than base levels. This impact translates to almost 80,000 fewer jobs in 2011 than in the base.

Employment in the MODERATE ZERO simulation is less than one per cent lower than the base by 1992. This impact grows to over 2 per cent in 1996 after which the magnitude of the impact diminishes. By 2011 employment is less than one half of one per cent (just over 6,000 jobs) lower than base levels. The impacts for the RAPID ZERO simulation are somewhat stronger. Employment is short of one per cent below base levels in 1992, peaking at 5 per cent by 1997. Thereafter the impact declines, falling to just under one per cent (14,000 jobs) lower than base levels in 2011.

As may be expected, the FIFTY PER CENT simulation reveals the strongest impacts. In 1992 employment is almost 1 per cent lower than base case levels. This impact rises to a peak of just less than 7 per cent by 2006. Employment remains at almost 7 per cent less than base levels for the rest of the forecast. By 2011 there are 140,000 fewer jobs in the shock simulation than in the base.

The pattern of change in employment in the ENHANCED 25 simulation is similar to the change in GDP. After initially falling to a trough of 2 per cent less than base levels in 1996, the impact on employment begins to improve. By 2011 employment has grown to just under 3 per cent higher than base levels. This represents a gain of approximately 56,000 jobs.

Figure 6 (following) presents the shares, for the forest related industries and all other producers, of employment in the constant timber harvest scenario. As with GDP, the share of forest industry employment is waning in the long term. Employment in the forestry sector falls from 7 per cent of total employment in 1992 to 4 per cent by 2011.

FIGURE 6

SHARE OF TOTAL EMPLOYMENT
CONSTANT HARVEST (BASE) SCENARIO

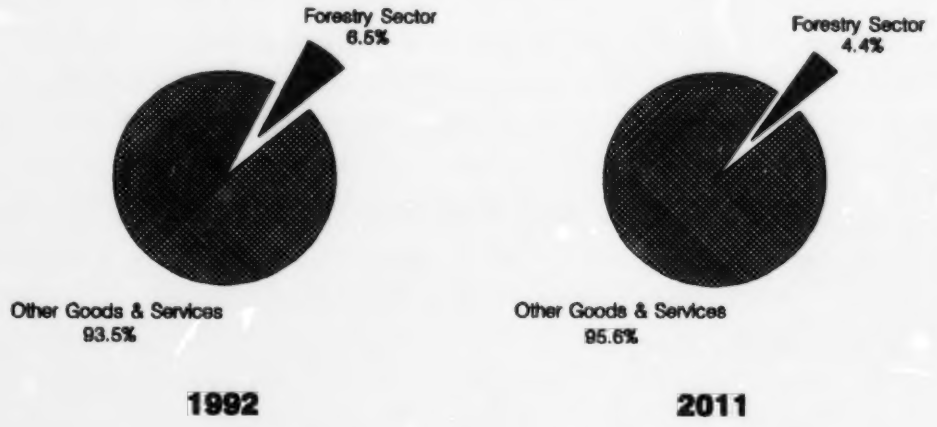
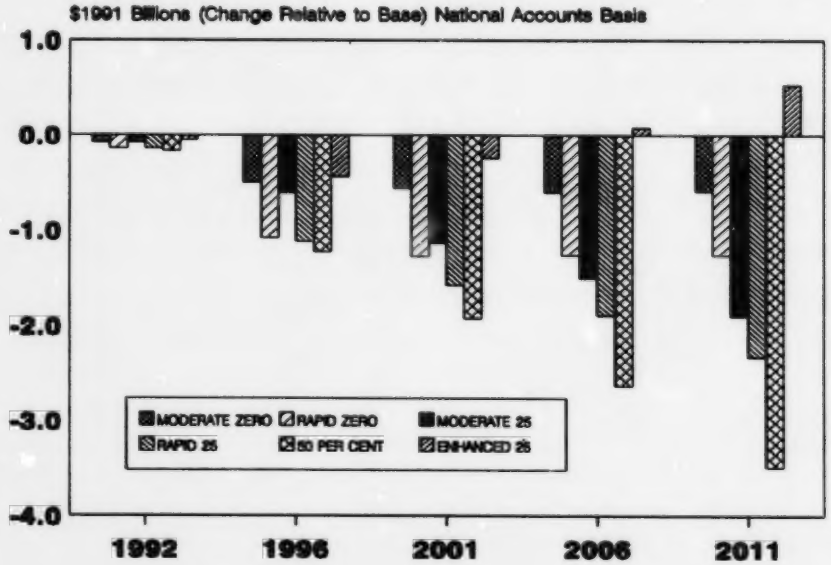


FIGURE 7

PROVINCIAL FISCAL BALANCE IMPACT
OF CHANGE IN TIMBER HARVEST



The impacts on the provincial fiscal balance (on a National Accounts Basis) are presented in Figure 7 (page 13). There is assumed to be no change in Provincial fiscal policy measures (for example tax rates or expenditures on goods and services) over the forecast period in all simulations. Not surprisingly, the reduction in timber harvest results in a worsening of the government's fiscal position, presented in $1991. The MODERATE ZERO simulation results in the least impact on the fiscal balance among the declining harvest scenarios. By 2011, the fiscal deficit is estimated to be $0.6 billion higher than in the base. The largest impact occurs in the 50 PER CENT simulation; by 2011 the fiscal deficit has grown by $3.5 billion.

The declining harvest in the initial stages of the ENHANCED 25 simulation result in a moderate increase in the deficit prior to 2006. However, from 2006 through to the end of the simulation period, the simulation reports an increasing improvement in the provincial government's fiscal position.

3.2 MODERATE 25 Simulation

The results from the moderate path to a 25 per cent reduction in timber harvest are presented in Tables 2 through 4. In all discussions, the impact presented is relative to a base which reflects an FRC assumption of constant timber harvest at 1991 levels.

As shown in Table 2, the negative impact on real provincial GDP resulting from the timber supply reduction is at its maximum in 2001. There is still a large (-5.5 per cent) impact on GDP in 2011. The table should be read as follows: Looking at GDP at market prices we see in 1996 the shock results are 5.1 per cent lower than the base.

TABLE 2
MODERATE 25 - GENERAL INDICATORS
(per cent change from base)[13]

	1992	1996	2001	2006	2011
GDP at Market Prices	-1.0	-5.1	-7.1	-6.6	-5.5
Consumer Expenditures	-0.2	-2.8	-4.5	-4.8	-4.3
Investment	-0.4	-3.7	-4.8	-4.6	-4.0
Exports	-2.5	-9.6	-13.9	-12.4	-10.0
Imports	-0.2	-2.9	-4.6	-4.9	-4.5
Wages and Salaries	-0.4	-4.8	-6.4	-6.0	-5.0
Employment	-0.3	-2.7	-3.9	-3.9	-3.4
Unemployment Rate	0.2	0.7	0.6	0.1	-0.0

13 See footnotes on page 8.

Real government expenditures on goods and services (which excludes transfers and interest payments) are not included in the above table because they are kept constant at base levels. The impact on exports grows to a peak in 2001, stabilizing at approximately 10 per cent in 2011. The impact on imports increases steadily to a peak impact in 2006 of 5.0 per cent, falling to 4.5 per cent by 2011. This reflects the pattern of impact on the other principal components of real GDP[14], Consumer Expenditures and investment, over the same time period. The decline in Consumer Expenditures relative to the base is due primarily to the fall in household income, that results from a decline in both employment and wage rates. These combine to bring about a difference in provincial wages and salaries of 5 per cent at the end of the forecast. Total investment, by 2011, is 4 per cent lower than base levels.

Employment is also reduced relative to the base. The simulation estimates a negative employment impact of less than one per cent in 1992, growing to almost 4 per cent less than base levels in 2006. The impact on employment in 2011 is 3.4 per cent which represents a difference of approximately 75,000 jobs relative to the base.

The impact on unemployment levels is muted due to changes in the labour force. The deterioration in the economic position of British Columbia relative to other provinces reduces inter-provincial migration. This, in turn, results in a lower labour force population than would have otherwise been the case.

These results are not inconsistent with, although somewhat smaller than, a previous study using the B.C. Input Output Model (BCIOM) which found that a 10 per cent reduction in forest related supplies would result in a 2.5 per cent reduction in GDP and a 2.2 per cent reduction in employment[15]. The results of the BCIOM model are linear and imply a 6.3 per cent reduction in GDP and a 5.5 per cent reduction in employment to accompany a 25 per cent reduction forest related supply. The employment impact is not as severe in the BC Model due to wage adjustments and the ability of firms to substitute labour for capital. As well, the model incorporates a changing industrial structure which the BCIOM assumes is constant. The BCIOM assumes that relative

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14 Real government expenditures on goods and services are not included in the above table because, as noted in Section 2.1, they were held constant at exogenously set levels.

15 The Provincial Economic Impacts of a Supply Reduction in the British Columbia Forest Sector, Ministry of Finance and Corporate Relations, Planning and Statistics Division, Quantitative Analysis Branch, February 1991, p. C.12.

factor prices and proportions remain constant. A more detailed discussion of changing factor proportions in the BC Model is presented in Appendix 1.

Table 3 presents the industry impacts of the 25 per cent timber supply reduction. As explained earlier, it is assumed that a 25 per cent reduction in timber supply will result in a 25 per cent reduction in the output of the primary forestry industry, as well as both the wood, and paper and allied manufacturing industries. In the primary forestry industry the reduction in employment is approximately proportional to the reduction in output. In 2011, the decline in employment of 22.4 per cent relative to the base reflects a difference of approximately 6,000 primary forestry jobs.

TABLE 3
MODERATE PATH TO 25 % REDUCTION IN TIMBER HARVEST
INDUSTRY IMPACTS
(per cent change from base)

	1992	1996	2001	2006	2011
FORESTRY					
GDP at Factor Cost[16]	-5.0	-19.0	-29.0	-28.0	-25.0
Average employment income[17]	-0.3	-3.7	-3.3	-1.6	-0.9
Employment	-2.5	-20.7	-29.7	-26.7	-22.4
Investment	-3.2	-18.7	-26.6	-24.9	-22.5
WOOD MANUFACTURING					
GDP at Factor Cost	-5.0	-19.0	-29.0	-28.0	-25.0
Average employment income	0.0	-1.6	-4.7	-6.1	-5.8
Employment	-1.2	-15.3	-22.7	-20.5	-15.9
Investment	-1.7	-10.9	-17.8	-18.6	-18.5
PAPER & ALLIED					
GDP at Factor Cost	-5.0	-19.0	-29.0	-28.0	-25.0
Average employment income	0.0	-0.8	-2.4	-3.1	-2.9
Employment	-1.5	-17.1	-25.9	-24.9	-20.5
Investment	-1.5	-10.5	-17.9	-19.8	-20.0
OTHER GOODS					
GDP at Factor Cost	-0.7	-4.0	-5.1	-4.5	-3.5
Average employment income	-0.0	-1.0	-1.3	-1.2	-0.9
Employment	-0.3	-2.9	-3.7	-3.7	-3.2
Investment	-0.3	-3.6	-4.2	-3.4	-2.2
BUSINESS SERVICES[18]					
GDP at Factor Cost	-0.5	-3.5	-5.1	-5.1	-4.5
Average employment income	-0.1	-1.6	-1.7	-1.3	-0.9
Employment	-0.2	-2.1	-3.3	-3.7	-3.5
Investment	-0.1	-1.8	-3.9	-4.9	-4.5

16 GDP at Factor Cost is presented in constant (1981) dollars.

17 The average employment income is defined as (Wages and Salaries)/Employment. This value is not reflective of just the hourly wage. Instead, it is a combination of hourly wage rates, hours worked and employment levels and is an estimate of the average (current dollar) wage bill per worker in the industry.

18 The business service sector excludes public sector services such as hospitals and schools and public administration.

In the wood manufacturing industry the adjustment of employment appears to be taking place more gradually than in the primary forest sector or the paper and allied manufacturing sector. In 2011 the employment reduction is 16 per cent, which is smaller than the change in wood production. This may be due, in part, to a decline in the hourly wage rate which causes wood manufacturing firms to substitute labour for capital at the new (lower) production levels. However, the model does not estimate the change in hourly wage rates. Employment is measured using the Statistics Canada Labour Force Survey definition[19]; the model does not differentiate between part-time and full-time work or the number of hours worked in a year. Thus the reduction in average employment income may be a combination of both a decrease in the hourly wage rate and a decrease in the number of hours worked.

Table 4 shows the fiscal impacts of the MODERATE 25 run. Total provincial government expenditures includes expenditures on goods and services, interest on the debt, and transfers. Transfers include spending on post secondary education, transfers to persons, subsidies, capital assistance and transfers to local governments and hospitals.

TABLE 4
MODERATE 25 - PROVINCIAL GOVERNMENT POSITION
National Accounts Basis

	1992	1996	2001	2006	2011
Expenditures (% change)[20]	-0.1	0.1	1.0	2.2	3.4
Revenues (% change)[20]	-0.6	-3.2	-4.5	-4.3	-3.8
Fiscal Balance ($1991 M)[21]	-74.4	-599.3	-1128.7	-1500.6	-1895.5
Fiscal Balance (% GDP)[22]	0.1	0.8	1.3	1.5	1.7

19 The Labour Force defines employed persons as those who, during the reference week, did any work at all or had a job but were not able to work for specified reasons.

20 These measures represent the per cent change in the selected variable (in $1991) relative to the base. To use revenues as an example, the measure is calculated as $100*(Revenue_S-Revenue_B)/Revenue_B$ where S is the shock simulation value and B is the base value.

21 This measures the level change in the provincial government balance in $1991 and is calculated as $Balance_S-Balance_B$.

22 This measure represents the percentage point change in the share of the current dollar provincial government deficit relative to GDP. It is calculated as $100*((|Balance_S|/GDP_S)-(|Balance_B|/GDP_B))$ where S represents the shock value and B reflects the base value. Note that this specification works since there is a deficit in all simulations.

The per cent change in expenditures and revenues are presented relative to the base. The fiscal balance is presented as a level change (in $1991) from the base. The fiscal balance (in absolute value) is also presented relative to GDP; by 2011, the provincial deficit as a proportion of GDP increased by 1.7 percentage points.

Table 4 clearly illustrates the deteriorating revenue position in the MODERATE 25 simulation relative to the base. Note that resource based royalties (which are a component of government revenues) are sensitive to the price effects assumed because royalties include stumpage fees which will vary with lumber prices. In these scenarios, B.C. industries are modelled as price takers in international markets. To the extent that the B.C. forest industry can influence world prices, the impact on resource based royalties estimated above will be overestimated. This is because the stumpage target rate is adjusted quarterly by the same percentage as the percentage change in a Statistics Canada lumber products index. Therefore, although the stumpage fees collected will decline with a reduction in the timber harvest, the magnitude of the decline will depend on the price response in the lumber market. Any upward movement in lumber prices would ultimately result in an increase in stumpage rates. This, in turn, would result in a smaller decrease in resource based royalties.

Business taxes would also be affected by a change in prices. Increased export prices would increase forest industry profits so that the negative impact on government revenues would be less than that which is presented above.

Looking at expenditures, we see that expenditures in the shock, after initially falling relative to the base increase to 3.4 per cent higher than the base by 2011. The provincial government deficit picture is also worsening relative to the base. By 2011, the provincial deficit, in $1991, has grown by $1.9 billion.

The effects of factors such as lower government wage rates and a lower population level are acting to decrease expenditures over the simulation period. The decrease in government sector average employment income resulting from the increased unemployment rate acts to reduce government expenditures on wages and salaries. The higher unemployment rate also affects net migration so that the population in the shock simulation is smaller than in the base resulting in fewer population based transfer payments from governments to persons. However, increased public interest payments

relative to the base prop up the level of government spending. The increased deficits eventually act to increase government expenditures throughout the simulation period.

The final row in Table 4 presents the percentage point change in the provincial government balance relative to GDP. Currently, the government deficit accounts for roughly 2 per cent of GDP. Clearly, the share of the deficit of provincial output is higher in the MODERATE 25 run than in the base. For example, in 2001, the provincial government deficit corresponds to 1.3 percentage points more of total provincial output than in the base. The deficit continues to increase as a share of GDP throughout the forecast period relative to the base. By the year 2011, the provincial government deficit accounts for 1.7 percentage points more of GDP than it did in the base.

3.2 RAPID 25 Simulation

Results for the more severe path to a 25 per cent reduction in timber harvest are presented in Tables 5 through 7. As would be expected, the short and medium-term impacts of this simulation are larger in magnitude than for the MODERATE 25 simulation. However, the harsher impacts have worked themselves through by the end of the simulation. Table 5 presents the economy-wide effects of the simulation.

TABLE 5
RAPID 25 - GENERAL INDICATORS
(per cent change from base)[23]

	1992	1996	2001	2006	2011
GDP at Market Prices	-1.9	-9.7	-8.4	-7.1	-5.7
Consumer Expenditures	-0.3	-5.0	-5.9	-5.6	-4.6
Investment	-0.7	-6.6	-5.8	-5.2	-4.1
Exports	-4.5	-18.7	-16.4	-13.1	-10.3
Imports	-0.4	-5.2	-6.1	-5.8	-4.9
Wages and Salaries	-0.8	-8.6	-7.8	-6.6	-5.2
Employment	-0.5	-4.9	-4.8	-4.4	-3.6
Unemployment Rate	0.4	1.4	0.3	0.0	-0.2

Although the economy recovers to roughly the same levels as in the moderate -25 per cent shock, Table 5 clearly shows the medium-term economic distress to be more severe. Comparing the results in Table 6 with those of Table 3, we see that the long-

23 See footnotes on page 8.

term employment effects are similar in both the severe and moderate -25 per cent simulations for all industries. However, investment in the forestry related manufacturing industries remains at lower levels in the severe simulation compared with the moderate shock.

TABLE 6
RAPID 25 - INDUSTRY IMPACTS
(per cent change from base)[24]

	1992	1996	2001	2006	2011
FORESTRY					
GDP at Factor Cost	-9.0	-37.0	-33.0	-29.0	-25.0
Average employment income	-0.6	-6.8	-2.6	-1.5	-0.5
Employment	-4.6	-38.1	-34.5	-27.5	-22.0
Investment	-5.8	-35.3	-30.0	-26.2	-22.8
WOOD MANUFACTURING					
GDP at Factor Cost	-9.0	-37.0	-33.0	-29.0	-25.0
Average employment income	0.0	-2.8	-7.8	-7.4	-6.9
Employment	-2.2	-28.1	-28.6	-21.1	-15.5
Investment	-3.1	-20.6	-22.3	-21.6	-20.6
PAPER & ALLIED					
GDP at Factor Cost	-9.0	-37.0	-33.0	-29.0	-25.0
Average employment income	0.0	-1.4	-3.9	-3.7	-3.4
Employment	-2.7	-31.2	-32.4	-25.5	-19.7
Investment	-2.8	-19.9	-23.1	-23.0	-22.3
OTHER GOODS					
GDP at Factor Cost	-1.2	-7.6	-6.0	-4.7	-3.5
Average employment income	-0.1	-1.8	-1.6	-1.3	-1.0
Employment	-0.6	-5.3	-4.4	-4.1	-3.2
Investment	-0.5	-6.6	-5.0	-3.3	-1.9
BUSINESS SERVICES					
GDP at Factor Cost	-1.0	-6.4	-6.3	-5.7	-4.7
Average employment income	-0.2	-2.9	-1.8	-1.3	-0.9
Employment	-0.4	-3.9	-4.3	-4.4	-3.8
Investment	-0.1	-3.1	-5.8	-6.1	-5.0

Provincial fiscal implications are presented in Table 7. Although revenues decrease by similar amounts in both the RAPID 25 and MODERATE 25 simulations, the increase in provincial government expenditures is higher in all years in the harsher shock. The deficit is also consistently higher in RAPID 25 than in MODERATE 25. Similarly, the provincial deficit is a larger share of GDP in the RAPID 25 run than in the MODERATE 25 simulation.

24 See footnotes on page 16.

TABLE 7 RAPID 25 - PROVINCIAL GOVERNMENT POSITION[25] National Accounts Basis					
	1992	1996	2001	2006	2011
Expenditures (% change)	-0.2	0.2	1.9	3.5	4.9
Revenues (% change)	-1.1	-6.0	-5.5	-4.7	-3.9
Fiscal Balance ($1991 M)	-134.3	-1109.6	-1517.8	-1891.1	-2326.2
Fiscal Balance (% GDP)	0.2	1.5	1.7	1.9	2.0

3.3 MODERATE ZERO Simulation

TABLE 8 MODERATE ZERO - GENERAL INDICATORS (per cent change from base)[26]					
	1992	1996	2001	2006	2011
GDP at Market Prices	-1.0	-4.1	-2.7	-1.5	-0.3
Consumer Expenditures	-0.2	-2.3	-2.1	-1.5	-0.6
Investment	-0.4	-3.0	-1.9	-1.2	-0.3
Exports	-2.5	-7.6	-5.2	-2.8	-0.5
Imports	-0.2	-2.4	-2.2	-1.6	-0.7
Wages and Salaries	-0.4	-3.8	-2.5	-1.5	-0.3
Employment	-0.3	-2.2	-1.6	-1.0	-0.3
Unemployment Rate	0.2	0.5	-0.0	-0.1	-0.2

As seen in Table 8, the long-term impacts on the economy of the MODERATE ZERO shock are relatively small. However, the effects on employment and output are more significant in the medium term.

Table 9 presents the industry impacts of the moderate path to end up at 1991 harvest levels by 2011. The table reveals some interesting results. Over the long-term the structure of industry inputs reflects more labour and less capital in the wood and paper and allied manufacturing sectors[27]. As mentioned previously, firms in the primary forestry, wood manufacturing, and paper and allied industries are assumed to minimize costs subject to their level of output. Therefore, any decrease in the wage rate relative to the cost of capital will result in a substitution of labour for capital while producing

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25 See footnotes on page 17.

26 See footnotes on page 8.

27 While this is true of all simulations presented in this paper, the effect is most evident in the MODERATE ZERO and RAPID ZERO simulations.

the same level of output. Relative costs change in the simulation. This results in a higher level of employment than would otherwise occur for any given level of output. By 2011, both the paper and allied and wood manufacturing industries show higher levels of employment relative to the base along with lower levels of investment.

TABLE 9
MODERATE ZERO - INDUSTRY IMPACTS
(per cent change from base)[28]

	1992	1996	2001	2006	2011
FORESTRY					
GDP at Factor Cost	-5.0	-15.0	-10.0	-5.0	0.0
Average employment income	-0.3	-2.8	-0.5	0.2	0.7
Employment	-2.5	-16.7	-10.5	-5.0	1.4
Investment	-3.2	-15.0	-9.1	-5.1	0.3
WOOD MANUFACTURING					
GDP at Factor Cost	-5.0	-15.0	-10.0	-5.0	0.0
Average employment income	0.0	-1.5	-2.9	-2.4	-1.6
Employment	-1.2	-12.6	-9.3	-4.3	0.7
Investment	-1.7	-8.8	-7.8	-5.9	-3.2
PAPER & ALLIED					
GDP at Factor Cost	-5.0	-15.0	-10.0	-5.0	0.0
Average employment income	0.0	-0.7	-1.5	-1.2	-0.8
Employment	-1.5	-14.0	-10.6	-4.5	0.5
Investment	-1.5	-8.5	-8.0	-6.0	-3.7
OTHER GOODS					
GDP at Factor Cost	-0.7	-3.3	-1.8	-0.9	-0.0
Average employment income	-0.0	-0.8	-0.5	-0.3	-0.1
Employment	-0.3	-2.3	-1.3	-0.8	-0.1
Investment	-0.3	-2.9	-1.4	-0.5	0.4
BUSINESS SERVICES					
GDP at Factor Cost	-0.5	-2.8	-2.1	-1.4	-0.4
Average employment income	-0.1	-1.2	-0.5	-0.2	0.1
Employment	-0.2	-1.7	-1.5	-1.2	-0.6
Investment	-0.1	-1.5	-2.3	-1.9	-1.0

The primary forestry sector reports increases in both employment and investment relative to the base in 2011. This results from the faster capital stock adjustment in this industry. Toward the end of the simulation, due to the U-shaped nature of the shock, and rapid capital stock adjustment, capital stocks must be rebuilt to reflect desired levels, resulting in increased investment relative to the base. Given the lower capital stock and identical output levels at the end of the forecast period, employment levels must be greater in the shock simulation than in the base.

Table 10 presents the fiscal impacts of the MODERATE ZERO simulation. The province's net fiscal position shows a deterioration relative to the base in 2011, mainly

28 See footnotes on page 16.

due to increased interest payments. However, the share of provincial output accounted for by the deficit has increased only marginally.

TABLE 10
MODERATE ZERO - PROVINCIAL GOVERNMENT POSITION[29]
National Accounts Basis

	1992	1996	2001	2006	2011
Expenditures (% change)	-0.1	0.1	0.9	1.5	2.0
Revenues (% change)	-0.6	-2.6	-1.8	-1.1	-0.2
Fiscal Balance ($1991 M)	-74.7	-488.8	-552.0	-593.9	-579.7
Fiscal Balance(% GDP)	0.1	0.6	0.6	0.6	0.5

3.4 RAPID ZERO Simulation

The results for the simulation depicting a rapid path to a zero per cent reduction in timber harvest (relative to 1991 levels) are presented in Tables 11 through 13. The rationale behind the results is similar to that which was discussed for the MODERATE ZERO scenario. As expected, the magnitude of impacts resulting from the severe shock are larger than those from the moderate simulation.

TABLE 11
RAPID ZERO - GENERAL INDICATORS
(per cent change from base)[30]

	1992	1996	2001	2006	2011
GDP at Market Prices	-1.9	-9.3	-6.4	-3.0	-0.6
Consumer Expenditures	-0.3	-4.9	-4.9	-3.2	-1.3
Investment	-0.7	-6.5	-4.6	-2.5	-0.6
Exports	-4.5	-17.7	-12.3	-5.3	-1.0
Imports	-0.4	-5.1	-5.1	-3.3	-1.5
Wages and Salaries	-0.8	-8.5	-6.1	-2.9	-0.6
Employment	-0.5	-4.8	-3.8	-2.2	-0.6
Unemployment Rate	0.4	1.3	-0.0	-0.4	-0.4

29 See footnotes on page 17.

30 See footnotes on page 8.

TABLE 12
RAPID ZERO - INDUSTRY IMPACTS
(per cent change from base)[31]

	1992	1996	2001	2006	2011
FORESTRY					
GDP at Factor Cost	-9.0	-35.0	-24.0	-10.0	0.0
Average employment income	-0.6	-6.7	-1.3	0.7	1.4
Employment	-4.6	-37.2	-26.0	-8.2	3.1
Investment	-5.8	-34.0	-22.1	-8.7	0.5
WOOD MANUFACTURING					
GDP at Factor Cost	-9.0	-35.0	-24.0	-10.0	0.0
Average employment income	0.0	-2.8	-7.1	-5.3	-3.4
Employment	-2.2	-27.6	-22.9	-7.9	1.9
Investment	-3.1	-19.9	-18.0	-11.9	-6.9
PAPER & ALLIED					
GDP at Factor Cost	-9.0	-35.0	-24.0	-10.0	0.0
Average employment income	0.0	-1.4	-3.5	-2.7	-1.7
Employment	-2.7	-30.6	-25.8	-9.7	1.6
Investment	-2.8	-19.2	-18.7	-13.1	-8.1
OTHER GOODS					
GDP at Factor Cost	-1.2	-7.3	-4.4	-1.7	-0.1
Average employment income	-0.1	-1.8	-1.2	-0.5	-0.1
Employment	-0.6	-5.2	-3.3	-1.8	-0.3
Investment	-0.5	-6.5	-3.7	-0.8	0.9
BUSINESS SERVICES					
GDP at Factor Cost	-1.0	-6.3	-5.0	-2.8	-1.0
Average employment income	-0.2	-2.8	-1.3	-0.3	0.1
Employment	-0.4	-3.8	-3.5	-2.6	-1.2
Investment	-0.1	-3.1	-5.3	-4.3	-2.2

TABLE 13
SEVERE ZERO - PROVINCIAL GOVERNMENT POSITION[32]
National Accounts Basis

	1992	1996	2001	2006	2011
Expenditures (% change)	-0.2	0.2	1.9	3.2	4.3
Revenues (% change)	-1.1	-5.8	-4.4	-2.1	-0.4
Fiscal Balance ($1991 M)	-134.3	-1076.9	-1272.1	-1260.2	-1258.4
Fiscal Balance (% GDP)	0.2	1.4	1.4	1.2	1.0

3.5 FIFTY PER CENT Simulation

Presented below are the results of the FIFTY PER CENT scenario. This shock is somewhat different from the others in that it reflects a continuing decline in harvest levels.

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31 See footnotes on page 16.

32 See footnotes on page 17.

TABLE 14
FIFTY PER CENT - GENERAL INDICATORS
(per cent change of real values)[33]

	1992	1996	2001	2006	2011
GDP at Market Prices	-2.3	-10.3	-11.3	-11.4	-10.8
Consumer Expenditures	-0.4	-5.7	-7.5	-8.1	-8.0
Investment	-0.8	-7.3	-7.8	-8.0	-7.5
Exports	-5.5	-19.4	-22.1	-21.3	-19.6
Imports	-0.5	-5.9	-7.7	-8.4	-8.3
Wages and Salaries	-0.9	-9.6	-10.2	-10.2	-9.7
Employment	-0.7	-5.5	-6.3	-6.7	-6.5
Unemployment Rate	0.5	1.3	0.7	0.3	0.1

Since the reduction in timber harvest continues throughout the simulation, there is little moderation of the impacts toward the end of the forecast period. The incremental timing of the shock does allow lags and induced effects to sufficiently work themselves though; hence the levelling off of impact in the later years of the forecast.

TABLE 15
FIFTY PER CENT - INDUSTRY IMPACTS
(per cent change from base)[34]

	1992	1996	2001	2006	2011
FORESTRY					
GDP at Factor Cost	-11.0	-38.0	-45.0	-48.0	-50.0
Average employment income	-0.7	-7.3	-4.5	-3.3	-2.4
Employment	-5.6	-41.4	-46.3	-45.9	-45.7
Investment	-7.1	-37.2	-41.1	-43.2	-45.2
WOOD MANUFACTURING					
GDP at Factor Cost	-11.0	-38.0	-45.0	-48.0	-50.0
Average employment income	0.0	-3.5	-8.8	-10.3	-10.5
Employment	-2.7	-31.7	-36.7	-34.7	-32.5
Investment	-3.8	-22.1	-28.8	-31.7	-34.1
PAPER & ALLIED					
GDP at Factor Cost	-11.0	-38.0	-45.0	-48.0	-50.0
Average employment income	0.0	-1.7	-4.4	-5.1	-5.3
Employment	-3.3	-34.9	-41.6	-41.3	-40.7
Investment	-3.4	-21.4	-29.6	-33.7	-37.0
OTHER GOODS					
GDP at Factor Cost	-1.5	-8.2	-8.2	-7.8	-6.9
Average employment income	-0.1	-2.1	-2.1	-2.1	-1.9
Employment	-0.7	-5.8	-6.0	-6.4	-6.2
Investment	-0.6	-7.5	-6.7	-5.8	-4.5
BUSINESS SERVICES					
GDP at Factor Cost	-1.2	-7.0	-8.3	-8.7	-8.4
Average employment income	-0.2	-3.2	-2.6	-2.3	-2.0
Employment	-0.5	-4.3	-5.6	-6.4	-6.5
Investment	-0.2	-3.7	-7.0	-8.2	-8.0

33 See footnotes on page 8.

34 See footnotes on page 16.

TABLE 16 FIFTY PER CENT - PROVINCIAL GOVERNMENT POSITION[35] National Accounts Basis					
	1992	1996	2001	2006	2011
Expenditures (% change)	-0.3	0.3	2.2	4.1	6.0
Revenues (% change)	-1.3	-6.5	-7.2	-7.2	-7.2
Fiscal Balance ($1991 M)	-164.0	-1219.9	-1919.0	-2634.1	-3488.3
Fiscal Balance (% GDP)	0.2	1.6	2.3	2.8	3.3

The FIFTY PER CENT scenario results in a provincial government fiscal position that is, not unexpectedly, worse than in any of the other simulations. This scenario results in revenues that are 7.2 per cent lower than in the base. Expenditures on the other hand increase by 6 per cent. The net result is a provincial government deficit that is almost $3.5 billion (in $1991) higher in the shock simulation than the base. Looking at the deficit relative to GDP, by 2011, the provincial government deficit accounts for 3.3 percentage points more of provincial GDP in this run than in the base.

3.6 ENHANCED 25 Simulation

After dropping below base levels in the early part of the simulation, timber harvest levels are modelled to grow to 25 per cent higher than base levels by the end of the simulation. The results of the ENHANCED 25 scenario are presented below.

TABLE 17 ENHANCED 25 - GENERAL INDICATORS (per cent change of real values)[36]					
	1992	1996	2001	2006	2011
GDP at Market Prices	-0.6	-3.5	-0.3	2.5	4.8
Consumer Expenditures	-0.1	-2.1	-0.8	0.9	2.7
Investment	-0.2	-2.8	-0.3	1.5	3.2
Exports	-1.5	-6.1	-0.5	5.0	8.8
Imports	-0.1	-2.2	-0.8	0.9	2.7
Wages and Salaries	-0.3	-3.7	-0.4	2.2	4.4
Employment	-0.2	-2.0	-0.4	1.1	2.6
Unemployment Rate	0.1	0.5	-0.3	-0.5	-0.5

35 See footnotes on page 17.
36 See footnotes on page 8.

By the end of the simulation, real GDP is almost 5 per cent higher than base levels. However output did initially decline relative to the base in the early part of the simulation.

Employment in the province declined by 2 per cent (33,000 jobs) relative to base levels in 1996. In the remainder of the forecast employment levels begin to edge up, so that by 2011 there are 2.6 per cent more people employed (56,000 jobs) than in the base. Despite a growing labour force, job gains are sufficient to lower the unemployment rate by one half of one percent by the end of the forecast period.

As with the other scenarios, imports to the province closely reflect the pattern of change in consumer expenditures. The impact on exports is almost double the impact on GDP throughout the simulation. By 2011, provincial exports are almost 9 per cent higher than base levels.

TABLE 18
ENHANCED 25 - INDUSTRY IMPACTS
(per cent change from base)[37]

	1992	1996	2001	2006	2011
FORESTRY					
GDP at Factor Cost	-3.0	-12.0	0.0	13.0	25.0
Average employment income	-0.2	-3.1	1.1	2.0	2.6
Employment	-1.5	-15.7	0.1	13.7	25.5
Investment	-1.9	-13.5	0.5	12.1	23.4
WOOD MANUFACTURING					
GDP at Factor Cost	-3.0	-12.0	0.0	13.0	25.0
Average employment income	0.0	-1.1	-2.0	-0.1	1.8
Employment	-0.7	-11.6	-2.4	8.6	16.8
Investment	-1.0	-7.8	-2.3	4.3	11.1
PAPER & ALLIED					
GDP at Factor Cost	-3.0	-12.0	0.0	13.0	25.0
Average employment income	0.0	-0.6	-1.0	-0.0	0.9
Employment	-0.9	-13.1	-2.3	10.6	21.6
Investment	-0.9	-7.5	-2.6	4.0	11.2
OTHER GOODS					
GDP at Factor Cost	-0.4	-2.9	0.1	1.9	3.3
Average employment income	-0.0	-0.8	-0.1	0.4	0.8
Employment	-0.2	-2.2	0.0	1.3	2.8
Investment	-0.2	-2.7	0.0	1.8	3.0
BUSINESS SERVICES					
GDP at Factor Cost	-0.3	-2.5	-0.5	1.5	3.3
Average employment income	-0.1	-1.3	0.2	0.7	1.1
Employment	-0.1	-0.6	-0.5	0.7	2.1
Investment	-0.0	-1.3	-1.5	0.0	1.8

37 See footnotes on page 16.

As seen in the other shocks, the impact on employment is similar to that of investment in the primary forestry industry. By 2011, employment is up 25.5 per cent relative to base levels, while investment is up 23.4 per cent. Both the paper and allied industry and the wood manufacturing industry report employment impacts that are stronger than the change in investment. This is most evident in the paper and allied industry where employment has grown by 21.6 per cent (relative to the base) while investment is 11.2 per cent higher than base levels.

Output in the business services sector increases by 3.3 per cent over base levels by 2011. The impact on employment is such that by 2011 employment levels are 2.1 per cent (25,000 jobs) higher than in the base case. Investment in the industry is up by 1.8 per cent over base levels by the year 2011.

TABLE 19
ENHANCED 25 - PROVINCIAL GOVERNMENT POSITION[38]
National Accounts Basis

	1992	1996	2001	2006	2011
Expenditures (% change)	-0.1	0.0	0.8	1.1	1.1
Revenues (% change)	-0.4	-2.4	-0.3	1.5	3.3
Fiscal Balance ($1991 M)	-44.70	-427.9	-234.3	80.4	534.1
Fiscal Balance (% GDP)	0.1	0.5	0.2	-0.1	-0.5

On the fiscal side, the ENHANCED 25 simulation results in estimates of government expenditures that are 1.1 per cent higher than base levels by 2011. Revenues, however increase by 3.3 per cent over base levels. The net impact on the fiscal balance is to reduce the deficit (in $1991) by $534 million by 2011. Looking at the balance as a share of GDP, the ENHANCED 25 scenario results in a provincial government deficit that accounts for 0.5 percentage points less of GDP relative to the base.

38 See footnotes on page 17.

4 SUMMARY

The results discussed in Section 3 clearly demonstrate the importance of the forest industry to the British Columbia economy. The changes in harvest level had significant short and medium-term impacts on provincial GDP. The longer term impacts vary depending on the nature of the shock. The 25 and 50 per cent decline scenarios result in lower provincial output throughout the simulation. The zero percent simulations reveal provincial output that returns to base levels by the end of the forecast. The ENHANCED 25 scenario results in positive gains in all sectors of the economy.

Due to wage adjustments in the BC Model, the relative size of employment impacts were not as severe as the changes to real GDP. The MODERATE 25 scenario, for example, resulted in a 3.4 per cent reduction in provincial employment in 2011 which represents approximately 75,000 jobs. By comparison, real GDP fell by 5.5 per cent. In the ENHANCED 25 simulation job gains represent a smaller change than the impact on GDP

The reduction in employment affects more than just the forestry related industries. In fact, due to indirect and induced affects, over 55 per cent of the employment loss associated with the moderate 25 per cent harvest reduction would be in the service sector. Almost twenty per cent of the jobs lost would be in other goods producing industries which would also be affected indirectly by a slowdown in the forestry sector. A similar sharing of employment gains is seen in the ENHANCED 25 scenario.

Looking at the government sector, all shock simulations reveal a provincial government deficit that absorbs a larger share of GDP in the reduction shocks relative to the base. This should, however, be seen in the light of generally lower GDP levels by the end of the simulations (relative to the base) and provincial expenditures that are not declining as fast as the decline in GDP due to increasing public debt payments. The ENHANCED 25 scenarios results in lower deficits by the end of the forecast period, relative to base levels. The share of GDP accounted for by the deficit also declines by the end of the forecast period in the increased timber harvest scenario.

5 CONCLUSIONS

The forest industries are generally understood to be a major driving force within the British Columbia economy. Clearly there would be significant economic impacts if downward adjustments are made to permitted harvest levels. The BC Model provides a measure of these changes by using conventional econometric techniques to estimate the impacts of five separate supply reduction scenarios provided by the Forest Resources Commission. These impacts would be felt, to varying degrees, in all sectors of the economy.

In analyzing the fiscal impacts of the various harvest scenarios it should be noted that the results for government revenues would be altered if the export prices of the wood, and paper and allied industries were affected by changes in output. Further, the simulations were performed with no change in fiscal policy resulting from the reductions in the harvest level. Naturally, any changes in fiscal policy enacted as a result of the reduced revenues would also alter the fiscal balance.

The simulations reported were modelled using a specific set of assumptions provided by the Forest Resources Commission as to timber harvest levels. Several other areas where offsetting adjustments could be expected were reviewed:

- The magnitude of the export price responses which would result from changes in the timber harvest level and their impacts on government fiscal balance;
- The potential for the creation of additional value added activities by the wood, and paper and allied manufacturers as a result of a timber supply constraint;
- Government fiscal measures to offset the deterioration in the government balance resulting from sustained reductions in timber harvest;
- The impact of increased tourism and related activity that may occur as a consequence of reduced timber harvests; and
- Other structural changes that may occur in the B.C. economy such as the development of competing products.

However, in all these areas, the simplifying assumption was made that there would be no change in the *status quo*.

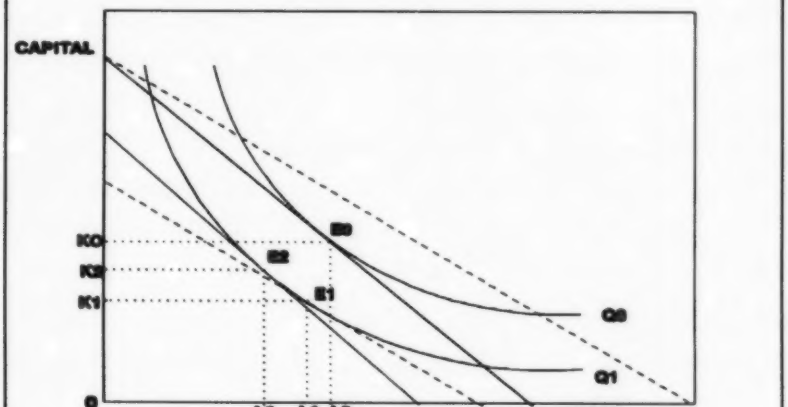
There is clearly room for additional analysis, particularly as to the nature of the forest industry's price response and the possible structural changes that may occur if these scenarios were to unfold. Readers may therefore wish to temper the results presented above according to their views of the most likely response in the British Columbia economy.

APPENDIX 1

In input-output or linear models, production functions are assumed to be Leontieff in nature so that at any given level of output, firms maintain constant factor proportions regardless of the relative factor prices. Further, relative factor prices are assumed to remain constant in input-output studies.

By contrast, the BC Model assumes flexible factor prices and proportions. Figure A1 is representative of any of the three forestry rel. d industries facing a supply reduction from Q0 to Q1 under the cost minimizing assumptions in the BC Model.

FIGURE A1
THE COST MINIMIZING FIRM



The firm will originally minimize costs at E0, the point of tangency between the original (solid) isocost line and the isoquant, Q0, which represents the original level of output. An isoquant is a locus of input mixes required to produce a given level of output. The isocost line is a constant cost line. The slope of the isocost line id equal to the ratio of the wage rate to the cost of capital times negative one.

A 50 per cent reduction in timber harvest will force the firm to reduce output by 50 per cent from Q0 to Q1. If wage rates did not decline then firms would minimize costs by hiring labour and capital to produce E2. However, with a decline in the wage rate, the isocost line will pivot (dashed line) so that the cost minimizing firm will hire labour and capital so as to minimize costs at E1 rather than E2. Note that this results in a smaller reduction in employment from L0 to L1 rather than L0 to L2.

APPENDIX II

		Assumes Rapid Reduction To Even Flow Sustainable Harvest		Assumes Timed Reduction to Even Flow Sustainable Harvest		Assumes Enhanced Stewardship
Year	50% Decline	25% Decline	0% Decline	25% Decline	0% Decline	25% Increase
1	-11%	- 9%	- 9%	- 5%	- 5%	- 3
2	-21%	-17%	-17%	-10%	-10%	- 7
3	-32%	-25%	-25%	-15%	-12%	-11
4	-35%	-31%	-31%	-17%	-14%	-15
5	-38%	-37%	-35%	-19%	-15%	-12
6	-39%	-36%	-33%	-21%	-14%	-10
7	-41%	-35%	-31%	-23%	-13%	- 7
8	-42%	-34%	-29%	-25%	-12%	- 5
9	-44%	-34%	-27%	-27%	-11%	- 2
10	-45%	-33%	-24%	-29%	-10%	0
11	-46%	-32%	-21%	-30%	- 9%	+ 3
12	-46%	-31%	-18%	-29%	- 8%	+ 5
13	-47%	-31%	-16%	-29%	- 7%	+ 8
14	-47%	-30%	-13%	-28%	- 6%	+10
15	-48%	-29%	-10%	-28%	- 5%	+13
16	-48%	-28%	- 7%	-27%	- 4%	+15
17	-49%	-28%	- 6%	-27%	- 3%	+18
18	-49%	-27%	- 4%	-26%	- 2%	+20
19	-50%	-26%	- 2%	-26%	- 1%	+23
20	-50%	-25%	0%	-25%	0%	+25

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